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THE BOTANICAL GAZETTE

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In the July number will appear:

On the genus Lindbladia, by DR. GEO. A. REX, *Philadelphia, Pa.*

The morphology and anatomy of the tendrils of Passiflora cærulea, by D. T. MACDOUGAL, *of Purdue University, Lafayette, Ind.*

An apparatus for determining the periodicity of root pressure, by M. B. THOMAS, *Professor of Botany, Wabash College, Crawfordsville, Ind.*

On the apical growth of the stem and development of the sporangium of Botrychium Virginianum, by C. L. HOLTZMAN, *of Indiana University, Bloomington.*

BOTANICAL GAZETTE

JUNE, 1892.

On nomenclature.

SERENO WATSON.

[It was the request of the late Dr. Sereno Watson that the following communication, dictated by him in his last illness, should appear at an early date in the BOTANICAL GAZETTE.— EDS.]

For some time I have had a desire to give expression to my views upon botanical nomenclature. Under the circumstances, I must speak briefly and somewhat dogmatically. In my opinion botany is the science of plants and not the science of names. Nomenclature is only one of those tools which is necessary to botany, and this being the case, points of nomenclature should be subordinated to science.

A principle of botanical convenience has been established by those who prefer one name to another on account of expediency or convenience. This principle should have a great deal of influence. It has been so recognized by the greatest botanists, and from their authority receives great weight. I prefer the word *expediency* as a better term than convenience to designate the principle, that the demands of science override any merely technical claims of priority, etc.

Priority of specific names appears to be based entirely upon one section of the code of 1867. That simply says that when a species is transferred from one genus to another, the specific name is maintained. This principle is usually understood and applied in the way that the oldest specific name has a right in all cases to be retained. It cannot fairly be so interpreted and applied, since it governs only to the extent that this should be the law, but it is not to be made an *ex post facto* law. Thus when a transfer has been made, that ends the matter so far as the choice of a specific name is concerned, and no one is authorized to take up a different name. This practice of retaining the oldest name *under the genus*, no matter what older specific names there may be, was adopted by Dr. Gray in his later years and by the Kew bot-

anists, for the reason that once established and pretty generally recognized, it would avoid the great mass of synonymy, which is being heaped like an incubus upon the science. I must express surprise that Dr. Britton has not considered it his duty to publish the last written words of Dr. Gray which were addressed to him upon this subject and which expressed his positive opinions upon this point.

There is nothing whatever of an ethical character inherent in a name through any priority of publication or position which should render it morally obligatory upon anyone to accept one name rather than another; otherwise it would be applicable or true as well in the case of ordinal names, morphological names, teratological, and every other form of name, to which now no one feels himself bound to apply the law of priority. The application of this law as at present practiced by many botanists, which would make it the one great law of botanical nomenclature, before which every other must yield regardless even of common sense, is a mere form of fetichism exemplified in science. Many instances of the application of this law are not science but are rather superstition.

February 22, 1892.

The North American Lejeuneæ.

F. STEPHANI.

In his Descriptive Catalogue of N. A. Hepaticæ Dr. Underwood has collected the names of all Lejeuneæ reported to have been found in the United States and Canada. Amongst these are four species, which Taylor published as having come from Cincinnati, while they had been collected on the shores of the Amazon, near the city of Pará, which Taylor believed to be a place in the vicinity of Cincinnati. These four species are *Lej. cyclostipa*, *polyphylla*, *testudinea* and *longiflora*, all of which having been described before, now bear other names. His *Lejeunea calyculata* too is merely the common form of *Lej. clypeata* Schweinitz. There remain only the following species, to which I have added four newly detected plants: *Lej. trifaria* Nees, *Lej. Wrightii* G., *Lej. Cardoti* Steph., *Lej. Underwoodii* Steph. The North American Lejeuneæ have to be arranged as follows:

a. Holostipæ.

1. *Neuro-Lejeunea catenulata* Nees: a most beautiful little plant and well described, page 323, in Synopsis Hepaticarum.
2. *Archi-Lejeunea clypeata* Schweinitz.
   Syn.: *Lej. calyculata* Taylor.
3. *Archi-Lejeunea xanthocarpa* L. & L.: quite different from *Lej. catenulata* to which it has not the least resemblance.
4. *Mastigo-Lejeunea auriculata* Hook. & Wils.
   Syn.: *Phragmicoma versicolor* L. & L.
5. *Lejeunea Mohrii* Austin, which I have not seen.

b. Schizostipæ.

6. *Euosmo-Lejeunea trifaria* Nees: newly detected in Florida, in large tufts on bark of trees.
7. *Eu-Lejeunea Austini* Lindb.
8. *Eu-Lejeunea Caroliniana* Aust.
9. *Eu-Lejeunea serpyllifolia* Libert.
10. *Eu-Lejeunea Underwoodii* Steph. n. sp.
11. *Micro-Lejeunea Cardoti* Steph. n. sp.
12. *Micro-Lejeunea lucens* Taylor: not at all identical with *Lej. cucullata* Nees, which looks more like *Lej. minutissima.*
13. *Micro-Lejeunea ulicina* Taylor: Lindberg found this in a tuft of *Lej. serpyllifolia* from Charleston; see his Hepaticæ in Hibernia lectæ, page 482. Taylor gave this name to a minute plant with stipules, while *Lej. minutissima* Smith has none; the synonymy has been much confused and even Lindberg has fallen into errors, which Spruce has already corrected. I wish to repeat, therefore, that Lindberg's *Lej. inconspicua* is the true *Lej. minutissima* while his *Lej. minutissima* is *Lej. ulicina.*
14. *Colo-Lejeunea calcarea* Libert (1820): a name for which Lindberg has substituted Taylor's name *Lej. echinata,* which was not given before 1844. Hooker published this plant as *Jungermania hamatifolia,* var. *echinata;* Mme. Libert, recognizing it as a distinct species was not obliged to use the name echinata. Lindberg in doing so, wronged the old author and multiplied the names without any necessity. Spruce in his admirable work on the Hepaticæ Amazonicæ et Andinæ, page 292, uses the name *Lej. calcarea* Libert.
15. *Colo-Lejeunea Jooriana* Aust. I have not seen.
16. *Colo-Lejeunea minutissima* (Smith.)
    Syn.: *Lejeunea inconspicua* De Notaris.

17. *Colo-Lejeunea parvula* Aust. I have not seen. See Lindberg l. c. page 481.

18. *Colo-Lejeunea Wrightii* Gottsche: this plant, growing on bark of living trees, has been sent me from Louisiana, leg. Langlois. It was known before from Cuba, and together with *Lej. trifaria*, *L. auriculata* and *L. xanthocarpa*, is largely distributed throughout tropical America. The last species is found also throughout Africa, where it has been found on the slopes of the Kilimandscharo, in the island of Fernando Po opposite Cameroon and also at the Cape of Good Hope. Truly an extensive distribution!

There remain two species, which I have never seen and the suborder of which is not to be recognized from the descriptions; these are

19. *Lejeunea laete-fusca* Austin.

20. *Lejeunea Ravenelii* Austin.

I conclude by giving the descriptions of the before named new species viz.:

Micro-Lejeunea Cardoti n. sp.—Dioica, exigua, dense caespitosa, viridis. *Caulis* multiramosus, ramis recte patentibus, filiformibus. *Folia* normaliter late ovata, oblique patentia, dorso longe soluta, ventre grandilobulata, *lobulus* inflatus apice excisus, hamatim longe dentatus. Folii *cellulae* 1 . Incrassatis angulosa nulla. Ocella 3 ad basin folii 0.017×0.025 mm. Plurima folia lobulos reductos, plicaeformes, ostendunt. *Amphigastria* ovata, usque ad basin fere bifida, laciniis lanceolatis. Flores feminei pseudolaterales; *folia floralia* subaequaliter biloba, conduplicato-concava, lobis brevibus obtusis. *Amphigastrium florale* foliis suis aequilongum, ovatum, ad $\frac{1}{3}$ bifidum, lobis obtusis. *Perianthium* pyriforme, *inflato-quinquangulare*, rostro subnullo.

Proxima *Lejeuneae ulicinae*, quae differt foliis fere rotundis, dorso longius accretis, foliorum lobulo multo majore, dimidium folii tegente, cellulis distincte incrassatis. *Lejeunea bullata* Taylor differt foliis fere erectis, ellipticis. *Lejeunea lucens* T. multo major est et toto coelo diversa.

HAB.: Louisiana (*Langlois*). Mexico (*Pringle*).

Eu-Lejeunea Underwoodii n. sp.—Dioica, flavicans, dense depresso caespitosa, minor. *Caulis* vage ramosus, flaccidus. *Folia* subplana, late ovata, oblique a caule patentia, antice caulem tegentia haud superantia, apice *angulato-repanda*. *Cellulae* foliorum margine 0.012 mm., medianae 0.017 mm.,

basales 0.017×0.025 mm., *trigonis magnis acutis*. *Lobulus* diametro caulis duplo longior, decurrens, carina arcuata sinu lunato in folium excurrente, apice exciso-truncatus, angulo brevidentato, ceterum valde convexus, margine supero involuto. *Amphigastria* caulina ovata, caule plus duplo latiora, ad medium fere bifida, sinu angusto laciniis acutis. *Flores feminei* in caule ramisque pseudolaterales, raro in angulo furcarum. *Folia floralia* caulinis minora, arcuatim divergentia, e basi angusta falcato-oblonga, lobulo lanceolato profunde soluto, acuto. *Amphigastrium florale* foliis suis aequimagnum, oblongum, ad ⅓ incisum, rima angusta, laciniis muticis.

Perianthia et *androecia* ignota.

HAB.: Florida (*Underwood*). *Lejeunea Caroliniana* monoica est. *Lejeunea Austini* cellulis multo minoribus gaudet. A remarkable feature in this plant is the *large incrassations* at the angles of the cells, which form very distinct triangles with acuminate points.

Kaiser Wilhelm str. 9., Leipzig, Germany.

Flowers and insects. VIII.

CHARLES ROBERTSON.

ISOPYRUM BITERNATUM Torr. & Gray.—The plants grow in damp, rich woods, in small patches, notably about bases of trees. The stem rises a few inches and bears a few-flowered cyme, in which only one or two flowers are open at the same time.

The flowers are white, sometimes with a purplish tinge; they are strongly heliotropic and measure about 14 or 15 mm. across, the five oval petals expanding horizontally. The stamens are numerous, the outer elongating and discharging pollen first. Nectar is probably secreted by the bases of the filaments; insects probe among them with their proboscides, evidently for nectar. The four styles at first overtop the inner stamens, and have receptive stigmas before any of the anthers discharge, so that the flower is female in the first stage.

When the cyme contains two open flowers, one of them is commonly in the male, the other in the female stage. In case of insect visits, the latter is more apt to receive pollen from another stem, but may receive it from the older flower

on the same stem. If the stigmas are not pollinated before the outer anthers begin to dehisce, they might receive pollen from them by insect aid or by the closing of the petals. Later, when the inner anthers discharge, if the stigmas remain unfertilized, they may receive pollen falling from the anthers which now overtop them. But insects are by far the most important agents in effecting self-pollination, which, however, I think is the exception.

The flowers remain open all day and open on two or three successive days. For the attention of insects the plant is in strong competition with a number of plants, most of which have the advantage, especially *Claytonia Virginica*, which is much more abundant and more attractive.

The flower is adapted to short-tongued bees and flies, which come for both honey and pollen. It seems especially attractive to bees of the genus *Halictus;* the list shows all of the early-flying species I have found in my neighborhood, except *H. ligatus* and *confusus*, and more species than I have ever found on any other flower.

I have found the flowers in bloom from March 24 to May 12. On twelve days, between March 26 and April 25, I observed the following visitors:

Hymenoptera—*Apidae:* (1) Apis mellifica L. ☿, s. & c. p., freq.; (2) Bombus americanorum F. ♀, s., one; (3) Synhalonia honesta Cr. ♂, s., one; (4) Ceratina tejonensis Cr. ♂, s.; (5) C. dupla Say ♂, s.; (6) Osmia albiventris Cr. ♂ ♀, s.; (7) Nomada bisignata Say ♂ ♀, s.; *Andrenidae:* (8) Andrena bicolor F. ♂ ♀, s., freq.; (9) A. sayi Rob. ♂ ♀, s.; (10) A. erigeniae Rob. ♂ ♀, s.; (11) A. flavo-clypeata Sm. ♀, c. p.; (12) A. rugosa Rob. ♂ ♀, s.; (13) A. forbesii Rob. ♀, s.; (14) A. claytoniae Rob. ♂, s.; (15) Agapostemon radiatus Say ♀, s.; (16) Augochlora labrosa Say ♀, s.; (17) A. pura Say ♀, s.; (18) Halictus gracilis Rob. ♀, s.; (19) H. 4-maculatus Rob. ♀, s.; (20) H. pectoralis Sm. ♀, s.; (21) H. coriaceus Sm. ♀, s.; (22) H. forbesii Rob. ♀, s.; (23) H. lerouxii Lep. ♀, s. & c. p.; (24) H. fasciatus Nyl. ♀, s. & c. p., ab.; (25) H. cressonii Rob. ♀, s.; (26) H. pilosus Sm. ♀, s.; (27) H. obscurus Rob. ♀, s. & c. p., ab.; (28) H. stultus Cr. ♀, s., c. p., f. p.; (29) H. zephyrus Sm. ♀, s., ab.; (30) H. imitatus Sm. ♀, s., one; (31) Colletes inaequalis Say ♂, s.

Diptera—*Bombylidae:* (32) Bombylius fratellus Wd., s., ab.; *Empidae:* (33) Empis sp., s., one; *Syrphidae:* (34) Chil-

osia capillata Lw.; (35) Melanostoma obscurum Say; (36) Syrphus ribesii L.; (37) S. americanus Wd.; (38) Mesograpta marginata Say; (39) M. geminata Say; (40) Sphaerophoria cylindrica Say; (41) Eristalis dimidiatus Wd.; (42) Helophilus similis Mcq.; (43) Xylota fraudulosa Lw.—all s. & f. p.; *Tachinidae:* (44) Gonia frontosa Say, s.; *Muscidae:* (45) Lucilia cornicina F., s.

Coleoptera—*Coccinellidae:* (46) Megilla maculata DeG., f. p., one; *Chrysomelidae:* (47) Diabrotica vittata F., f. p., one; *Œdemeridae:* (48) Asclera ruficollis Say, f. p.; *Anthicidae:* (49) Corphyra terminalis Say, f. p.

Hemiptera—*Capsidae:* (50) Lygus pratensis L., s., one.

SANGUINARIA CANADENSIS L.—This is a common plant of wide distribution. In my neighborhood, however, it is rather rare; at any rate, I know of but a few stations for it.

Each plant bears a single scape rising about one decimeter and supporting an 8 to 12-petaled, white flower, which expands about 4 or 5 cm. The plants are sometimes collected in little clusters, so that the flowers are made quite conspicuous and must attract insects from a distance. In the morning the petals are expanded horizontally, but in the afternoon they become more erect, preparatory to closing.

The flowers are female in the first stage. On the first day of opening, the large, two-lobed stigma is receptive, while the anthers are still closed. By the time the anthers are beginning to discharge, the stigma has turned brown, its papillae appearing shriveled.

The numerous stamens are of unequal length, the outer being much shorter. The tips of the inner anthers sometimes barely rise as high as the stigma, in which case, provided pollination has not previously occurred, the stigma might receive a little pollen from the surrounding anthers. The pollen is the attraction for insects, although I have seen hive-bees and *Bombylius fratellus* Wd. vainly probing for nectar about the base of the ovary.

The newly opened flowers are smaller and less widely expanded. Insects land upon them, dusting their stigmas before perceiving that the anthers are indehiscent. The result is cross-fertilization between distinct plants.

In competition with *Sanguinaria* are *Anemonella thalic-*

troides, Isopyrum biternatum, Claytonia Virginica, Erigenia bulbosa and *Erythronium albidum*, all of which have the advantage.

The flowers are monopolized by hive-bees, which collect the pollen so effectually that it is very difficult to find out what were the normal visitors of the flower. There is little doubt, however, that the plant originally depended for fertilization mainly upon the aid of bees of the genera *Halictus* and *Andrena* and flies of the family *Syrphidae*.

I have found the flowers in bloom from April 2 to 13. On April 13 I noted the following visitors:

Hymenoptera—*Apidae:* (1) Apis mellifica L. ☿, c. p., ab.; *Andrenidae:* (2) Halictus zephyrus Sm. ♀, c. p.; (3) H. stultus Cr. ♀, c. p.

Diptera—*Syrphidae:* (4) Syrphus sp., f. p.

Coleoptera—*Œdemeridae:* (5) Asclera ruficollis Say, f. p., freq.

I also saw several individuals of *Andrena bicolor* F. ♂ flying about the flowers in search of the female, which is probably a visitor.

At Madison, Wisconsin, May 9, Professor Trelease found the flower visited for pollen by *Andrena bicolor* F. ♀ and *Halictus confusus* Sm. ♀.

BAPTISIA LEUCOPHAEA Nutt.—This plant is rare in my neighborhood; I know of but one station for it, on creek bluffs. The stems rise about a foot from the ground, are diffusely branched and bear large, drooping racemes of handsome, cream-colored flowers.

The calyx tube measures about 5 or 6 mm. and serves to hold the petals so that they can not easily be separated by intruders. The banner runs forward for about 14 mm. when it rises nearly straight upwards. Its blade measures 20 mm. or more in breadth, and is not so strongly reflexed at the sides as in *B. leucantha*. The wings extend forward and conceal the keel. At the base above, the blade is inflected upon a gibbosity upon the base of the keel, with the result that, when a bee lands upon the flower, it depresses both wings and keel.

The stamens are distinct. Since there is is no special opening at the base to admit the bee's tongue, as in the diadel-

phous Papilionaceae, the bee inserts its proboscis between the upper filaments. The filaments are somewhat unequal in length. The anthers dehisce in succession, so that to remove all of the pollen, bees must visit each flower several times. The stigma is situated among the anthers, and I find nothing to prevent self-pollination. The flower has more accessible nectar than in B. leucantha, but on account of its early blooming, it has less need of adaptation to exclude shorter tongues, since it is mostly exposed to *Bombus* females and species of *Synkalonia.*

Osmia latitarsis was the only bee visiting it for both honey and pollen, and there may be an important relation between the flower and the bee, which are both equally rare. I have as yet taken the female of this *Osmia* only on the present flower.

The following list of visitors was observed on May 16 and 19:

Apidae: (1) Bombus separatus Cr. ♀, s.; (2) B. americanorum F. ♀, s.; (3) Synhalonia speciosa Cr. ♀, s.; (4) Osmia latitarsis Cr. ♀, s. & c. p.

TRIFOLIUM PRATENSE L.—("Adv. from Eu.")—I have been much interested in observing how frequently this well-known bumble-bee flower is visited by Lepidoptera. It is a common thing for bee-flowers to be visited to some extent by butter-flies, but this seems to me to be an unusual case. In Germany, Müller found it visited by 8 Lepidoptera in a list of 39 insects, while in Illinois I have found it visited by 13 species in a list of 20. Our flowers are exposed to a richer butterfly-fauna, so that we may expect to find a larger proportion of butterflies upon them, and the differences between bee and butterfly-flowers may not be so well indicated in the lists of visitors.

But while butterflies may sometimes effect cross-fertilization of the red clover, they are of doubtful value, if not injurious. Bumble-bees depress the keel so that their heads and proboscides are well dusted with pollen. But butterflies can insert their thin tongues without depressing the keel, and, even if they get a little pollen on their thin proboscides, it is apt to be wiped off by the closely approximated tips of the petals, which close the mouth of the flower.

I have found it in bloom from April 26 to Nov. 4. On 15 days, May 10 to Sept. 11, I noted as visitors:

Hymenoptera—*Apidae:* (1) Bombus ridingsii Cr. ♂, once; (2) B. separatus Cr. ♂ ♀ ☿, ab.; (3) B. pennsylvanicus DeG. ♀ ☿, ab.; (4) B. americanorum F. ♂ ♀ ☿, very ab.; (5) B. vagans Sm. ☿, s., one; (6) Anthophora abrupta Say ♂ ♀.

Lepidoptera—*Rhopalocera:* (7) Danais archippus F.; (8) Argynnis cybele F.; (9) Pyrameis atalanta L.; (10) P. huntera F.; (11) P. cardui L.; (12) Lycaena comyntas Godt.; (13) Papilio cresphontes Cram.; (14) Pieris rapae L.; (15) Callidryas eubule L.; (16) Pamphila peckius Kby.; (17) P. cernes B.-L.; (18) Eudamus tityrus F.; *Sphingidae:* (19) Hemaris axillaris G.-R.

Birds—*Trochilidae:* (20) Trochilus colubris L., thrice.

The following table gives the visitors which have been observed sucking the flowers in the normal way:

REGION.	Bombus.	Anthophora.	Eucera.	Anthidium.	Megachile.	Osmia.	Bombylius.	Lepidoptera	Trochilus.	Total.
1. In Low Germany—Müller,[1] ...	12	1	1	1	1	1	8	..	..	25
2. In the Pyrenees—MacLeod,[2] ..	6	1	..	..	..	..	1	11	..	19
3. In Illinois.....	5	1	..	..	..	..	..	13	1	20

HEUCHERA HISPIDA Ph.—Each plant of this common species bears several scapes, which rise 6 to 9 dm., and bear long panicles of greenish flowers.

The calyx is oblique, being quite gibbous on the lower side. It measures about 6 mm. in length, the lobes being directed forward and a little inward and the petals filling the intervals, so that the effect is much the same as if the parts were united to their tips. The tube is very broad, measuring about 4 mm. wide, so that it readily admits the head and thorax of a bee.

The stamens lengthen and discharge pollen in succession, beginning with the upper one. Accordingly, to collect all of the pollen, the flower must be visited several times.

The flowers are proterogynous[3] with long-lived stigmas, and are remarkable for being visited exclusively by a species

[1] Fertilization of Flowers. [2] Pyreneënbloemen. [3] Müller, Fertilization of Flowers, 243.

of *Colletes*, *C. heucherae* Rob., the females coming for honey and pollen, and the males for honey and in search of the females.

It blooms from May 11 to June 29.

LYTHRUM ALATUM Ph.—The plants are common in wet places. The stems grow 4 or 5 dm. high, are much branched and bear many loose racemes of purple flowers. The six petals are each marked with a reddish line leading to the base. They expand so that the flowers measure 15 mm. across.

The dimorphism of the flowers was first recorded by Halsted in the Bulletin of the Iowa Agricultural College, 1888. In the short-styled form the stigma reaches the throat of the calyx tube, and the stamens are exserted from 3 to 4 mm. In the long-styled form the stigma is exserted about 3 mm., and the anthers only reach the throat. In this form the stamens are variable, sometimes giving an appearance of trimorphism; but the unequal length seems only to prevent crowding of the anthers in the narrow tube.

The plants often grow in large patches, which renders them quite conspicuous, and very attractive to insects. The calyx-tube is narrow and measures 5 or 6 mm. in length, which restricts the visitors to long tongues. The principal visitors are butterflies. On 12 days, June 18—Aug. 18, the following list was observed:

Hymenoptera—*Apidae:* (1) Bombus virginicus Oliv. ☿, s. & c. p., freq.; (2) Melissodes bimaculata Lep. ♂, s., freq.; (3) Megachile petulans Cr. ♂, s.; (4) M. brevis Say, ♂ ♀, s., freq.; (5) Coelioxys 8-dentata Say ♀, s.; (6) Epeolus lunatus Say ♀, s.; *Andrenidae:* (7) Agapostemon nigricornis F. ♀, s.

Lepidoptera—*Rhopalocera:* (8) Pieris protodice B.-L.; (9) P. rapae L.; (10) Colias philodice Godt.; (11) Pyrameis cardui L.; (12) Chrysophanus thoe B.-L.; (13) Pamphila peckius Kby.; (14) P. cernes B.-L.; (15) Pholisora catullus F.—all s.

Diptera—*Bombylidae:* (16) Systoechus vulgaris Lw.; (17) Exoprosopa fasciata Mcq.; (18) E. fascipennis Say—all s.; *Syrphidae:* (19) Helophilus latifrons Lw.; (20) Tropidia quadrata Say—both f. p.

Carlinville, Ill.

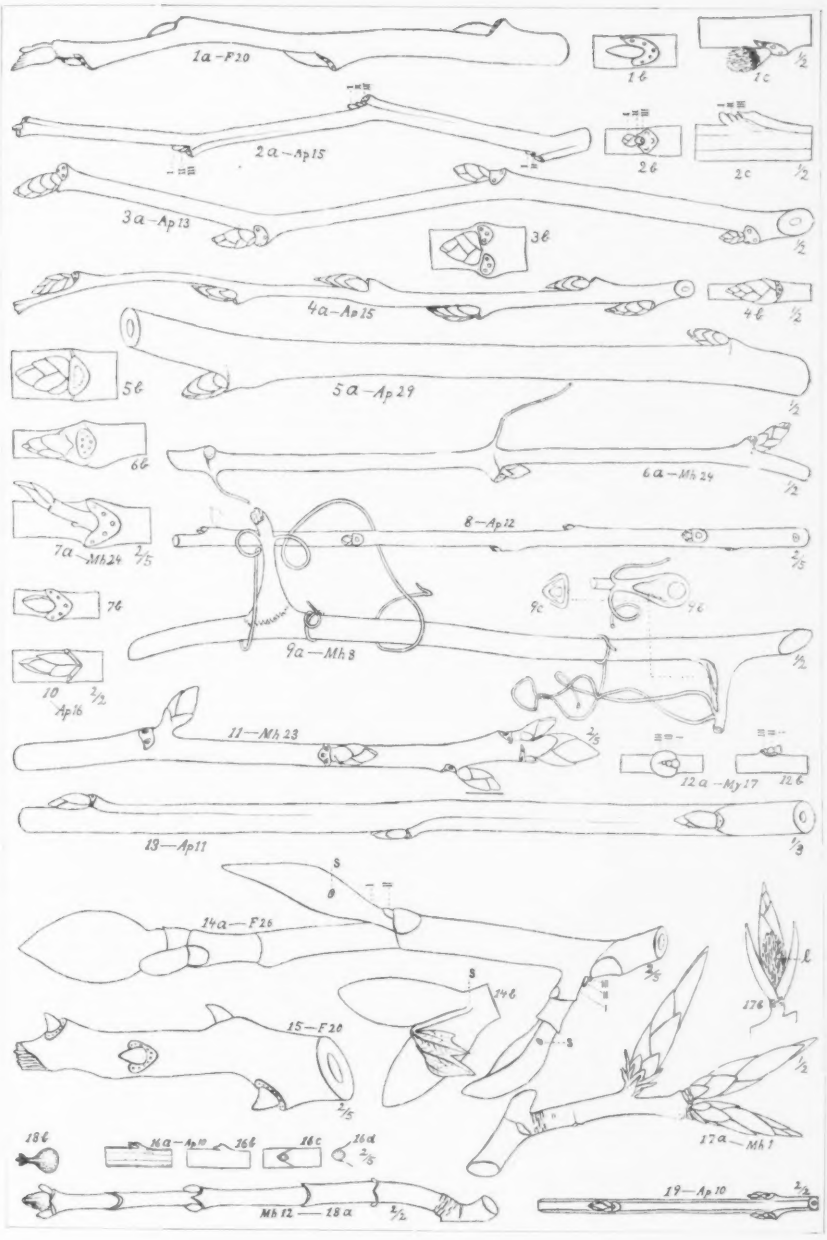
The identification of trees in winter.

AUG. F. FOERSTE.

(WITH PLATES XII AND XIII.)

Any method of identifying ligneous plants other than the ordinary one by means of their flowers and leaves, must necessarily be very artificial. Under these circumstances it is important to use as a means of comparison those parts of ligneous plants which are certain to be present both in the young growth and in the fully matured plant, and which, during the various stages of development from the small sapling to the superannuated tree, show essentially the same characteristics. There is only one part of ligneous plants which approximately fulfills these conditions and that is the crop of little twigs added each year to the tips or the sides of the branches, with the petiole-scars from the last season's leaves and the subtended, more or less scaly, winter buds which enclose a portion or all of the growth of the coming season in rudimentary form.

As a matter of fact the length of these twigs varies considerably at different stages in the history of the same individual and even on different branches of the same tree or shrub during the same season; moreover the form and size of the petiole-scars and the scaly buds vary quite commonly on approaching the tips or the base of even the same twig. If, however, the length of a twig be left out of consideration, and only the larger petiole scars and scaly buds be made objects of comparison, the constancy of color and markings of the bark, of the character of the pith, of the form and structure of the petiole-scars, of the figures presented by the foliar fibrovascular bundles, and of the form and structure of the scaly buds, is very striking. This constancy of characteristics within the limits of the same species is supplemented by sufficient *variation* in the features presented by *different* species, to make it possible to use these characteristics in recognizing the genus of ligneous plants and, in the great majority of cases, also the species. The various characteristics presented by ligneous plants will be discussed in the order of the importance, thus providing at the same time a plan in accordance with which ligneous plants can be classified artificially so as to facilitate their identification.



FOERSTE on TREES in WINTER.

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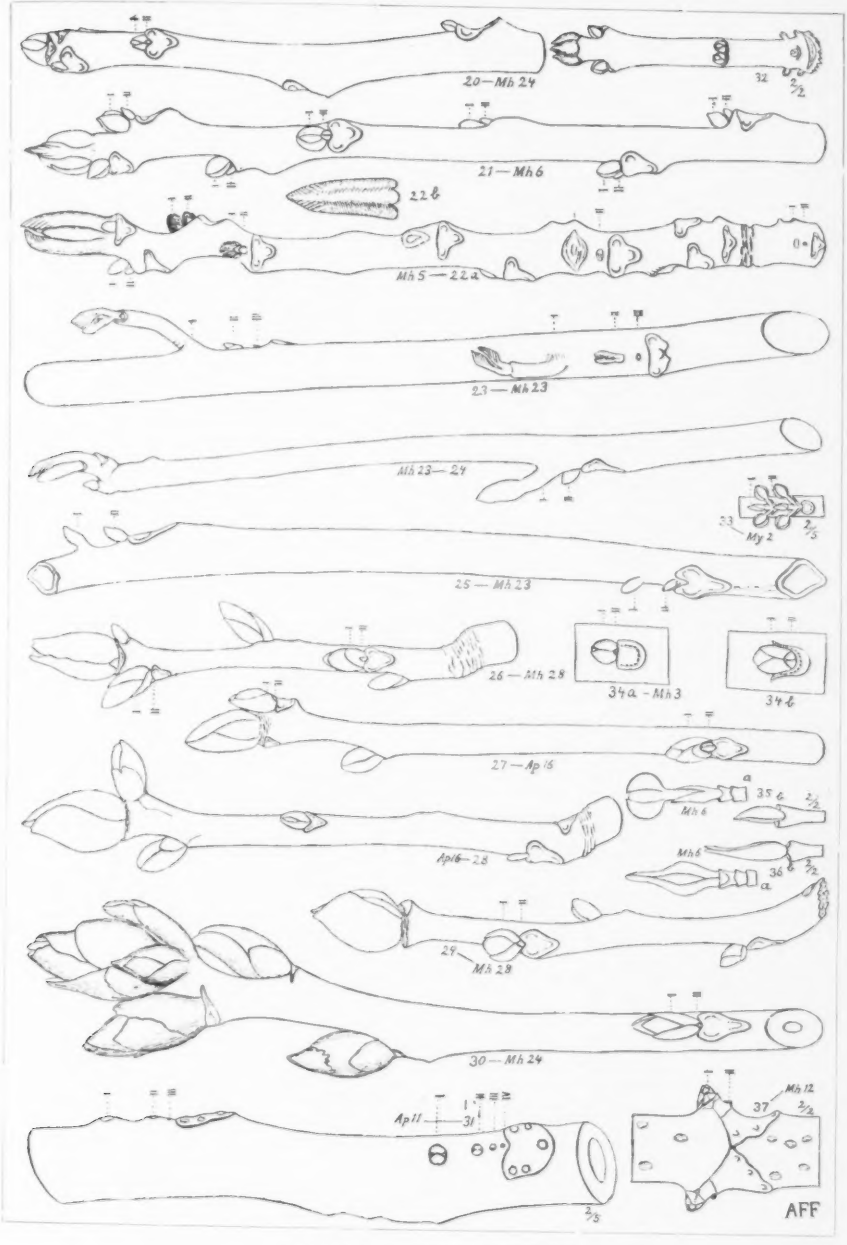

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I. The determination of the phyllotaxy of the leaves of the species examined, as shown by the petiole-scars remaining from last year's leaves, is the first step towards identification. It so happens that a classification of shrubs and trees into those with alternate, spiral, and opposite or whorled leaves gives rise to three fairly equal sets. The determination of the phyllotaxy of a plant at once excludes quite a large list of shrubs and trees with another kind of arrangement of leaves from the list of possibilities. The rarer phyllotaxies such as $\frac{1}{3}$ (*Spiræa opulifolia* Linn., fig. 13); $\frac{3}{8}$ (*Diospyros Virginiana* Linn.) and $\frac{2}{5}$ (*Catalpa speciosa* Warder) will of course make the identification of a ligneous plant still more easy. In certain species the phyllotaxy is occasionally or even quite regularly (*Castanea*) more or less variable in different twigs of the same tree, but these cases are sufficiently rare not to give any serious difficulty.

II. The form of the more fully developed petiole-scars and the mode of disposition of the fibrovascular bundles where intersected at the petiole-scar is the second important means of classifying ligneous plants. The following are some of the most important types:

1. In those petiole-scars where the outline is markedly rounded, the fibrovascular bundles are often arranged in a sort of circle within the scar (*Morus rubra* Linn., fig. 5; *Ampelopsis quinquefolia* Michx., fig. 6; *Celastrus scandens* Linn., fig. 8; *Rhus aromatica* Ait., fig. 16; and *Catalpa speciosa* Warder). Sometimes these bundles take the form rather of a circular area than of a circle.

2. In those petiole-scars which have a broadly circular form below but a square outline above, the fibrovascular bundles are often arranged in the form of a semicircle (*Euonymus atropurpureus* Jacq., fig. 19; species of *Fraxinus*).

3. In certain petiole-scars which are strongly horseshoe shaped the bundles form a series having approximately the same shape (*Ptelea trifoliata* Linn., *Rhus glabra* Linn., fig. 15; as variations of the last type, in species of *Fraxinus*). In the preceding three types the fibrovascular bundles are arranged in an approximately continuous series. In many other cases they form several distinct sets in the same scar.

4. Thus in certain scars, usually more or less heart shaped, these bundles form lunate sets, either in considerable number

(*Ailanthus glandulosus* Desf.) or only with three in each scar (species of *Juglans*, *Pterocarya*, *Carya*, figs. 20–30.

5. In other scars of heart-shaped form, and in the great majority of those which are lunate, the fibrovascular bundles form small circular areas. These show a sufficient constancy in their number within the same scar if only the more fully developed scars be examined and if quite a number of twigs be drawn into consideration, so that a division into scars with only three sets (*Ulmus fulva*, Michx., fig. 3; *Celtis occidentalis* Linn., fig. 4; *Viburnum molle*, fig. 10; *Nyssa multiflora* Wang., fig. 11; *Spiraea opulifolia* Linn., fig. 13; *Hamamelis Virginica* Linn.), and into scars having five rounded sets of fibrovascular bundles is possible (*Asimina triloba* Dunal., fig. 1; *Rhus Toxicodendron* Linn., fig. 7; species of *Æsculus*). Sometimes these sets, normally five, are reduced to three in all the smaller scars, or on the weaker twigs. In other species the number usually five is occasionally raised to seven (*Sambucus Canadensis* Linn., fig. 37). The two outer sets are often more or less approximated while the median fifth set is left more isolated (*Gymnocladus Canadensis* Lam., fig. 31; *Acer saccharinum* Wang.). How far this character remains constant and therefore of value for present purposes has not been determined.

In species with opposite leaves it is also frequently of assistance to notice if the edges of the petiole scars are sufficiently extended laterally almost or quite to meet (*Cornus florida* Linn., fig. 35; *Cornus paniculata* L'Her., fig. 36.; *Negundo aceroides*, Moench, fig, 18; *Acer saccharinum* Wang.) or if they remain considerably separated from each other (species of *Fraxinus*, *Euonymus atropurpureus* Jacq., fig. 19; species of *Æsculus*.)

III. A third means for further classifying ligneous plants is the character of their winter buds.

1. These may be so situated, either concealed in the substance of the petiole scar itself, or covered by the anterior end of the scar, that the development of these buds towards spring requires the splitting of the scar, or at least a very marked forcing back of the anterior end of the same (*Menispermum Canadense* Linn., fig. 12; *Robinia Pseudacacia* Linn., *Rhus aromatica* Ait., fig. 16.

2. At times the buds are sunk into the bark of the twigs,

but are not covered by the petiole-scars, the flattened tops of the buds scarcely rising above the level of the scar or of the bark of the twig (*Gymnocladus Canadensis* Lam., fig. 31; *Ptelea trifoliata* Linn.). The flattened buds of *Ailanthus glandulosus* Desf. would probably form a closely related class. The remaining more prominently developed scaly buds can be most conveniently classified into:

3. Those which show only one or two scales exteriorly, with perhaps a glimpse of a third or fourth scale but no more (*Smilax hispida* Muhl., fig. 9; *Liriodendron Tulipifera* Linn., fig. 14; *Rhus glabra* Linn., fig. 15; *Diospyros Virginiana* Linn.; *Cornus florida* Linn., fig. 35; *Cornus paniculata* L'Her., fig. 36; *Asimina triloba* Dunal, fig. 1; *Tilia Americana* Linn.; *Lindera Benzoin* Meissner, fig. 33); and

4. Those with typically four or more scales exposed exteriorly. This class can be further subdivided into, *a*, those in which the terminal buds are typically much larger than the lateral buds (*Asimina triloba* Dunal, fig. 21; *Sassafras officinale* Nees; species of *Fraxinus*; *Juglans*, figs. 21, 22; *Carya*, figs. 26–30; *Negundo aceroides* Moench, fig. 18); and, *b*, those in which such a difference if noticeable is not typically of a marked character. In the terminal buds of the first division the exterior scales not uncommonly give more or less evidence of their origin as transformations of leaves. In the cases in which, on dissecting the scaly bud, the scales, with the exception often of the first two, are seen to be evidently metamorphosed stipules (*Liriodendron Tulipifera* Linn., fig. 14; *Fagus ferruginea* Ait.; species of *Quercus*, *Castanea*, *Carpinus*, *Corylus*, and *Tilia*) the list of possibilities is still further reduced. The marked crowding together of buds towards the tips of the branches, as in species of *Quercus*, is often evident enough to be quite characteristic of certain species, but does not serve well as a basis for more general classification.

IV. The manner in which branches are terminated gives a fourth means of distinguishing ligneous plants.

1. Thus the green tips of the newly developing twigs are in certain species cast off each spring, and in the winter-twigs the absence of the terminal bud and the presence of a scar there where the bud ought to be, can always be readily recognized (*Tilia Americana* Linn.; *Catalpa speciosa* Warder;

Ailanthus glandulosus; *Ulmus fulva* Michx., fig. 3). While in many species all, or almost all, of the tips of the branches are thus affected, in others (species of *Æsculus*) only one half the tips of the branches are thus terminated, while the remainder show the usual terminal scaly buds.

2. In other species the tip of the branches shrivels up at a very early date, before summer, but is not cast off, the shriveled tip remaining through the winter (*Diospyros Virginiana* Linn.; species of lilac).

3. Again in other cases the tiny tips are not killed in early spring, but quite a considerable portion of the more developed branch is killed back by the frosts of autumn.

4. Lastly, in the great majority of species, terminal scaly buds are always present.

V. A fifth means of determining ligneous plants is often given by the presence or absence of stipules, as indicated by the scars which remain after they have fallen off. Since these stipules usually fall off early in spring they frequently leave but indistinct scars in witness of their former presence, but a little practice will make the observer quite adept in recognizing even the poorer stipule-scars on the winter twigs. The stipule-scars, when present, may more or less encircle the stem, (*Liriodendron Tulipifera* Linn., fig. 14, or may be considerably separated, as usual (*Tilia Americana* Linn.; *Fagus ferruginea* Ait., fig. 17; *Morus rubra* Linn., fig. 5; *Hamamelis Virginica* Linn.) In certain species the stipules are represented by thorns, as in *Robinia Pseudacacia* Linn., and *Xanthoxylum Americanum* Mill. When these stipular thorns are aborted, as occurs at times in the latter species, the fibrovascular bundles destined to provide them with sap can be detected at the surface of the wood on removing the bark. Most ligneous plants never have stipules.

VI. The presence of thorns in general often provides a sixth means of distinguishing plants. Thorns representing stipules have already been mentioned. They often also represent small axillary branches, usually supplemented by normal leaf buds at their base. The relative position and character of the thorns and leaf-buds is then at times a means of distinguishing species. Thus, in *Gleditschia triacanthos* Linn., the thorn represents the upper of a series of superposed bud, and is often decidedly removed from the subtending

leaf scar; the thorn is frequently branched, and its branches subtended by distinct bracts. In *Crataegus Crus-galli* Linn., the thorn has two lateral buds, of which one exceeds the other considerably in size. The smaller bud usually perishes, the larger one develops, pushes the thorn aside, and in the older parts of the tree the thorn then assumes an apparently lateral position. In *Maclura aurantiaca* Nuttall there is usually a leaf bud on one side, and a long narrow scale with empty axil on the other.

The fact that in certain species the thorns representing branches appear only under abnormal conditions, or first in the older plants, reduces the value of thorns as constant features in distinguishing plants. Many ligneous plants also have thorns which represent only outgrowths of the bark. These are usually irregular in their disposition, but the triple spines of *Ribes Cynosbati* Linn., placed just beneath the petiole-scar is a good instance of the constancy of character and disposition sometimes shown by mere outgrowths of the bark.

VII. A seventh characteristic of ligneous plants is the presence or absence of more or less salient ridges on the bark. These show usually some more or less definite relation to the petiole scars, being frequently decurrent from the latter (*Spiræa opulifolia* Linn., fig. 13; *Cercis Canadensis* Linn. fig. 2; *Euonymus atropurpureus* Jacq., fig. 19). The more or less rounded angles of other plants are also worthy at times of observation, as in the case of the frequently eight to ten-angled stems of *Sambucus Canadensis* Linn., fig. 37.

In addition to these more important characteristics furnished by the annual growth of twigs which can be used in forming a sort of artificial classification of plants, there are others which are very useful in distinguishing the individual species.

The color of the bark of twigs usually varies in shades of brown or gray. When therefore a tree or shrub presents characteristically twigs with bark of a green color (*Negundo aceroides* Moench, fig. 18; *Sassafras officinale* Nees; *Euonymus atropurpureus* Jacq., fig. 19) or of various shades of red or purple, the color becomes a characteristic feature of value. The genus *Cornus* provides a striking instance of the success with which the color of the annual twigs can often be used in

distinguishing species. The little circular ruptures in the bark of *Sambucus Canadensis* Linn., fig. 37; and the milky juice exuding from the broken bark of *Morus rubra* Linn., fig. 5, in warmer weather are also good characteristics.

Again, the pith at times affords good features. Thus in *Diospyros Virginiana* Linn., the place of the pith is usually hollow; in *Gymnocladus Canadensis* Linn., fig. 31, the pith is reddish brown; in species of *Juglans*, fig. 20, and *Pterocarya Caucasica* Kenell, fig. 23, there is a tendency for the pith to separate into transverse plates.

The more special examination of the form of the petiole scars with their intersected fibrovascular bundles, the relative size and form of the scaly buds, the number of scales visible exteriorly, their relative size and form, are features so widely variable in different species, and yet so nearly constant in individuals of the same species, that they furnish often the best means for specific determination. The various figures presented on the accompanying plates give a very good idea of the great importance of these features for specific or at least generic determination.

The preceding discussion will suffice to give an idea of the great variety of features offered by all annual twigs of ligneous plants for the purposes of their identification. For the great majority of such plants they will suffice in determining the species, and in almost all cases there is no difficulty about the genus. Naturally there will be the least difficulty in recognizing species during winter where the flora has been best studied during spring and summer by ordinary botanical methods, and where the range of possible species is therefore very well known.

In addition to these more omnipresent characteristics there are others which are very good if present. Such are for instance the form and character of the flowering buds for next year, whether present in the shape of naked catkins or flower buds or enclosed in more or less scaly buds (*Rhus aromatica* Ait.; *Asimina triloba* Dunal, fig. 1; *Cornus florida* Linn., fig. 35; *Cornus paniculata* L'Her., fig. 36; *Lindera Benzoin* Meissner, fig. 33). The presence of flower buds within the scaly winter buds is often indicated only by the larger size of those scaly buds which contain flower buds as compared with those which contain only rudimentary leaves. It

is evidently often possible to dissect the buds and to make a careful study of the leaves and inflorescence of many species of ligneous plants and at times even of the flowers destined to blossom next year. In other words the ordinary means of botanical determination can to a certain extent be employed. As a matter of practice, however, this was rarely found necessary since the external features were found sufficient for purposes of identification.

The remains of the inflorescence of the last season is another good means of recognizing ligneous plants when this is present, as in the case of the fruited pedicels of *Diospyros Virginiana* Linn., the inflorescence of *Ptelea trifoliata* Linn., *Rhus glabra* Linn., *Ostrya Virginica* Willd., *Cornus florida* Linn. At times even the fruit remains for a large part of the winter, or is found immediately beneath the tree where it has fallen on the ground. The pods of *Hamamelis Virginica* Linn., naturally remain on the tree all winter since they do not ripen until next year.

The bark of the trees usually finds difficulty in accommodating itself to the increased circumference of the tree in its old age, so that it often provides good characteristics at that time for distinguishing species. Thus in the beech the bark remains comparatively smooth; in the sycamore it splits off in flat little pieces; in species of hickory it separates in long shaggy strips which remain more or less attached to the tree; in species of birch the bark separates into more or less thin sheets which wrap horizontally around the trunk of the tree and fall off at times. In the great majority of trees the bark cracks more or less in advanced age and the peculiar cracks thus caused form often very characteristic figures or designs—if this expression be given not too literal a sense—which can be used in recognizing the genera and at times even the species of trees. Old woodsmen use this means of identifying the older trees often with considerable success, although often mistaken in determinations of the younger intermediate trees of the same species in which the cracks are less developed.

And lastly the general habits of a ligneous plant, whether it be a vine or not, the curvature of its branches, and the like often give good characteristics, although the general aspect produced by the method of branching in a young individual and in an old tree may be very different (*Ulmus*).

Of course it must not be expected that winter twigs with their scars and buds will furnish better means of distinguishing closely related species than the ordinary botanical ones. On the contrary they are apt not to be so good. It is very astonishing, however, how successful a means of recognizing species these annual twigs can provide. Thus where species although placed in the same genus show very marked botanical differences in their inflorescence, flowers, and leaves, the characters provided by the winter buds are usually also very well marked. For this purpose the figures here given of the several species of the *Rhus* are very significant—*Rhus glabra* Linn., fig. 15, with its remains of last year's inflorescence; *Rhus aromatica* Ait., fig. 16, with its spikes for next year's blossoming; and *Rhus Toxicodendron* Linn., fig. 7. The figures given of *Cornus florida* Linn., fig. 35, and *Cornus paniculata*, L'Her., fig. 36, are also very suggestive.

On the other hand when the species are more closely related to each other there is greater difficulty in recognizing the species. And yet even then it will be seen that in proportion as the species are found to be more closely related to each other according to ordinary methods of botanical determination, they will also show greater resemblance in the characters presented by the annual twigs. The various species of walnut and hickory show this fact very well as can be seen from the accompanying figs. 20—30, which represent most of the known species. Of course in the case of the willow, where the species are distinguished often by slight characteristics, many of the species can be identified in winter only by the expert, by means of slight characteristics often beyond the power of accurate description. Any one however who will take a glance at the accompanying plates, which present with the exception of a few *Juglandaceæ* only the commoner species from the vicinity of Dayton, Ohio, arbitrarily selected for illustration, will be struck by the facility with which the various species can be recognized. Moreover it will also be seen that even the ordinary observer without botanical training can soon learn to distinguish the various species of his district during winter if he have drawings of typical annual twigs of the various species as a means of comparison.

There are in many states botanical institutions founded for

the purpose of giving practical assistance to people of that state on questions relating to botany, especially questions of practical utility. It certainly seems as though a ready means of distinguishing the ligneous plants of their states would not be the most unwelcome contribution which these institutions could make to the people if the writer can judge from the interest usually awakened among farmers and woodsmen on showing them the various means of readily recognizing the species in winter.

It is therefore believed that the preparation of a set of plates with typical figures of the annual twigs, their scars and buds, of the ligneous plants of different states, would at present be a desideratum, especially if accompanied by critical notes indicating the range of variations within the limits of the same species, and a statement of those characteristics which are most significant in the identification of each species.[1]

In any case the above notes may serve to indicate what features have been found serviceable in the identification of ligneous plants in the winter months during ten years experience and what are their relative importance. Possibly it may also lead some to take an interest in the winter condition of plants who have hitherto confined most of their botanical work to the spring and summer.

Hotel des Thermes, Paris.

EXPLANATION OF PLATES.

The superposed buds are numbered in the order of their appearance and development by Roman numerals. In *Liriodendron*, fig. 14, *s* indicates the point of juncture of the leaf proper with the sheath formed by the stipules. On the exterior sheaths the leaf itself is represented only by a scar. In *Fagus*, fig. 17, *l* indicates the hairy leaf found after the exterior scales have been removed. The two scales on either side are the stipules for this leaf. The figures, except fig. 32, were all prepared in 1883. The date at which they were collected is indicated in each case in abbreviated form. The phyllotaxy is also given, in the form of a fraction. These figures have been chosen because from the large amount of material at hand, *these* have been found to be the most typical also for subsequent years.

Plate XII.— 1. Asimina triloba Dunal. *c*. Flower bud. 2. Cercis Canadensis L. 3. Ulmus fulva Michx. *b*, bud subtended by two leaf scars, the latter representing but one leaf in the phyllotaxy; see fig. 32. 4. Celtis occidentalis L. 5. Morus rubra L. 6. Ampelopsis quinquefolia Michx. 7. Rhus Toxicodendron L. Notice how readily this species is distinguished from the last in the winter. 8. Celastrus scandens L. 9. Smilax hispida Muhl. *b*, the bud in the

[1] Just such a work as is here suggested has been in preparation for a number of years by one of our ablest botanists. We have recently inspected the drawings which are nearly completed, and the work will be ready for publication within a few years at most.—EDS.

leaf axil seen from above. *c*, a section of the bud to show the ½ phyllotaxy. 10. Viburnum molle Mx. 11. Nyssa multiflora Wang. 12. Menispermum Canadense L. 13. Spiræa opulifolia L. 14. Liriodendron Tulipifera L. *b*, one of the inner stipular sheaths of the winter bud showing a young leaf attached. 15. Rhus glabra L. 16. Rhus aromatica Ait. 17. Fagus ferruginea Ait. *b*, a bud with several scales removed. 18. Negundo aceroides Mœnch. 19. Euonymus atropurpureus Jacq.

Plate XIII.—20. Juglans regia L. Scales of terminal bud less leafy than in other species. 21. Juglans nigra L. Buds close to the axils. 22. Juglans cinerea L. Buds usually a short distance above the axil. *b*. A scale of terminal bud. 23. Pterocarya Caucasica Kenell. Peculiar leaf scar. 24. Carya amara Nuttall. Slender buds near the axil. In Carya the figures made by the fibro-vascular bundles are less distinct than in Juglans and often less distinct than here figured. 25. Carya olivaeformis Nuttall. Upper of the superposed buds often remote from the axil. 26. Carya porcina. This and the following species are forms intermediate between the two preceding species with more slender buds and the three following with more oval buds. 27. Carya microcarpa Nutt. 28. Carya tomentosa Nutt. To be distinguished from the next species by its more or less tomentose bark. A few scales have fallen off from the bud. 29. Carya alba Nutt. After a few scales have fallen off from the bud. 30. Carya sulcata Nuttall. Buds often clustered at the tip, outer scales with a close appressed pubescence; color, purplish brown, grading to greenish brown. 31. Gymnocladus Canadensis Lam. 32. Fraxinus excelsior L. From the Trocadero Gardens at Paris. Two buds in one axil. A single bud in the opposite axil, not seen. It is not a case of superposed buds, nor of one bud in the axil of the outer scale of the other, but a case of dédoublement. It is the opposite of that shown in fig. 3, *b*. 33. Lindera Benzoin Meissner. 34. Fraxinus. Species unknown, but both of them believed to belong to Fraxinus Americana. To show variation of scars, which is often great in species of this genus. 35. Cornus florida Linn. *a*, flower bud. Notice setting of buds in the tip of the stem; also in *b*, and compare with next species. 36. Cornus paniculata L'Her. *a*, flower bud. 37. Sambucus Canadensis L. The lower of the superposed buds, in a longitudinal section of the stem is seen to have its fibrovascular bundles connected at the base with those of the larger upper bud. These fibro-vascular bundles of the lower bud are bent *backwards* from the above mentioned point of junction, in order to reach the smaller bud; this has not been noticed in the case of the other superposed buds examined, where the fibro-vascular bundles are all directed forward.

Two new genera of Hyphomycetes.

A. P. MORGAN.

The following genera of the Mucedineæ or white molds I have had so long and they appear so distinct that I may now venture upon their publication. The first is the only genus of the Didymosporæ in Saccardo's system possessing cylindric spores. The second by its remarkable spores represents a section Dictyosporæ, which is not represented in the Mucedineæ of Saccardo's volume.

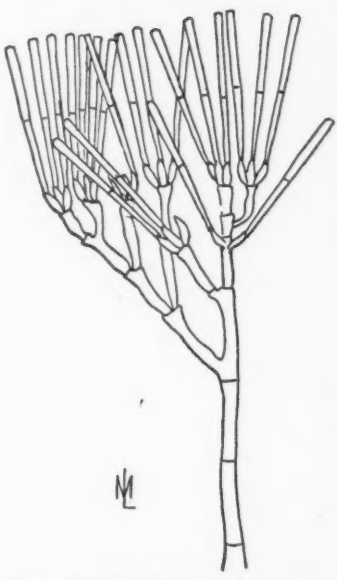


FIG. 1. *Cylindrocladium scoparium* Morgan.

Cylindrocladium gen. nov.—Sterile hyphæ creeping, branched; fertile hyphæ erect, forked or trichotomously branched, the sporophores in pairs or threes at the extremities of the branchlets and cymosely arranged; spores solitary, cylindric, 1-septate, hyaline.

C. scoparium n. sp.—Effused, thin, flocculose, white; sterile hyphæ creeping, slender, indistinct; fertile hyphæ thick, erect, hyaline, septate, cymosely branched above, the sporophores short, disposed in pairs or threes at the extremities of the branchlets, each producing a single spore at the apex; spores cylindric, tapering slightly downward, 1-septate, hyaline, obtuse at each end, 40—50μ in length, 4μ thick at the apex, and 3μ at the base.

Growing on an old pod of *Gleditschia triacanthos*. The sterile hyphæ are abundant enough, but they are fine slender

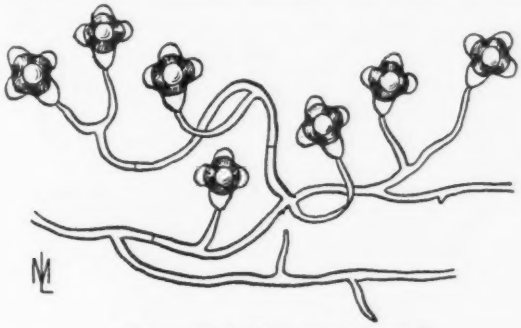


FIG. 2.—*Synthetospora electa* Morgan.

threads creeping close to or beneath the surface; the fertile hyphæ have a simple septate stem 5–7μ in thickness and are

dissolved above into a level-topped cyme of branches; their height, exclusive of the spores which easily fall off, is 125—150μ.

Synthetospora gen. nov.—Hyphæ procumbent, branched, intricate, sending out short lateral fertile branchlets, which produce the spores at the apex; spores lobed, each consisting of a large opaque central cell with several smaller hyaline cells sunk part way into its surface. The genus is a compound Mycogone.

S. electa n. sp.—Effused, thin, flocculose, white, becoming yellowish and pulverulent; hyphæ long, creeping, very slender, hyaline, scarcely septate, branched and loosely interwoven; the lateral fertile branchlets abundant, short, ascending, each terminated by a single spore; spores normally 6-lobate composed of a central globose cell, with a smaller spherical cell at the base, another at the apex, and four cells laterally on the circumference; the spores are 20—30 μ in extent, being usually a little longer from base to apex, the smaller hyaline cells measure 10—12 μ in diameter and project half way or a little more.

Growing on the hymenial surface of some *Peziza*, presumably *P. semitosta* B. & C. The habit and habitat are that of a Mycogone, but the double spore of the latter is greatly amplified. The hyphæ are quite slender, about 3 μ in thickness. The hyaline basal cell by which the spore is attached to the thread is sometimes drawn out to nearly conical; the symmetry of the spores is occasionally interfered with by the interposition of a fifth lateral cell.

Preston, O.

BRIEFER ARTICLES.

The chemical composition of the nectar of the Poinsettia.—The nectaries of *Poinsettia pulcherrima* are strongly developed and secrete so abundantly that the nectar drips away from the organs. From some specimens growing in the college green-house, a considerable quantity of the nectar was secured in very pure condition, by means of a fine pointed camels-hair pencil. It was a clear, colorless sirup, very sweet and becoming sticky on drying.

The total amount collected was 3.383 grams which, after standing some weeks over sulphuric acid, was reduced in weight to 2.3353

grams, or 69.02 per cent. of the original amount. This may be regarded as representing the solids of the nectar. It was transparent and non-crystalline. On being dissolved in water it showed a strongly reducing action toward Fehling's solution, indicating the presence of glucose sugars. In the polariscope a specific rotation of +13.7° was noted, which after inversion became —10.8° showing the presence of cane sugar. From the polariscope data were calculated 11.23 per cent. cane sugar and 57.7 per cent. glucose.

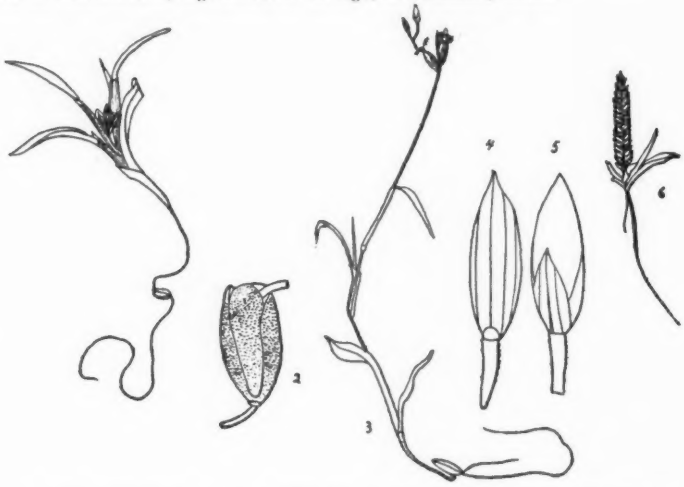
The small amount of material prevented a more extended examination. The composition is expressed very closely by these percentages: water, 30.98; cane sugar, 11.23; glucose, 57.79.

In this connection a late paper by P. C. Plugge (Archiv der Pharmacie *229*, 554) is of interest. Searching for the cause for Xenophon's reference to poisonous honey, he examined the nectar of *Rhododendron pontica* and found that it had a poisonous effect upon small animals. It was not ascertained if bees were harmed by it or not. The poisonous principle was isolated and called *andrometoxin*; it was also found in the nectar of several other Ericaceæ, the honey from which would undoubtedly be poisonous.—W. E. Stone, *Purdue University, La Fayette, Ind.*

Notes on Asclepias glaucescens and A. elata.—Dr. Palmer has just sent in from Colima, Mexico, the true *Asclepias glaucescens* HBK., which necessitates a change of name in our United States species. A. glaucescens was described and figured in Nov. Gen. et Spec. vol. III. p. 190, t. 223, from plants collected between Acapulco and La Venta de la Moxonera. Dr. Gray, in Syn. Flora vol. II. 92, refers the *A. Sullivantii* Torrey Bot. Mex. Bound. p. 162, to this species. The United States species, however, is clearly distinct from A. glaucescens and should be referred to *A. elata* Benth. Dr. Gray, however, in the Syn. Flora, Suppl. p. 401, considered the two the same species, but in the light of this new material I am convinced we have two good species although closely related. A. elata has oblong or oval leaves, rounded at the apex very like A. obtusifolia. A. glaucescens has much longer and narrower leaves, oblong to linear-oblong and acute. The flowers are much larger in A. elata and the hoods are spreading, exposing the gynostegium; in A. glaucescens the hoods are longer instead of shorter than the gynostegium and erect and connivent; there is also a good character in the horns. Dr. Gray describes the form as it is in A. elata (under A. glaucescens in Syn. Flora) where, in speaking of the hood, he says "the whole length within occupied by a broad and thin crest, which is 2-lobed at the summit, the outer lobe

broad and rounded, the inner a short, triangular, subulate, nearly included horn." In A. glaucescens the horn is a broad, triangular, incurved, entire beak.—J. N. Rose, *Department of Agriculture, Washington, D. C.*

Some depauperate grasses.—A number of small specimens of grasses were observed this spring in the propagating houses of the Horticultural Department. In many cases the seed from which the plant sprung was still attached to the root and showed no signs of decay. Three specimens were selected and drawn; *Setaria viridis* Beauv., *Panicum sanguinale* L., and *Eragrostis major* Host. These are common weeds here and are normally many-leaved and many-flowered, but having germinated in the sand they were forced for self-preservation into the production of seed much sooner than usual.—A. S. Hitchcock, *Agricultural College, Manhattan, Kans.*



Depauperate grasses: 1. Setaria viridis, natural size; 2. Spikelet attached to root of same, × 10; 3. Panicum sanguinale, natural size; 4, 5. Spikelet from inflorescence of same, × 10; 6. Eragrostis major, natural size.

CURRENT LITERATURE.

A text-book of bacteriology.

AN EXCELLENT addition to the list of hand books covering the subject of bacteriology, available to the English speaking student, has recently been published by an American firm. It is a translation of the third edition of the admirable work by Fraenkel,[1] which has already been favorably received by European teachers. The author was for a long time associated with Dr. Robert Koch, being in charge of the general laboratory of the Hygienic Institute in Berlin. The translation has been well performed by Dr. J. H. Linsley, and the publishers have put the work into an attractive and seviceable form.

The larger part of the work is devoted to laboratory methods and to the discussion of specific forms of bacteria. After a brief chapter regarding the biology of bacteria, the methods of manipulation, separation and cultivation of bacteria are treated in a particularly clear and serviceable way through nearly one hundred pages. A chapter of considerable length is devoted to the relation of bacteria to animal diseases, including the questions of susceptibility and immunity. The remainder of the book, except a few pages upon the investigation of air, soil and water, and upon yeast and molds, is devoted to specific kinds of bacteria, largely pathogenic.

The work is clearly written, with few or no digressions, and with the needs of the student, particularly the medical student, kept constantly in view. Everything that would divert the attention of the learner is omitted, and so there is no discussion of disputed points, and no citation of literature. Another omission, for which a good excuse is not apparent, is the total absence of illustrations. This sometimes necessitates rather long and uncertain descriptions of apparatus, of which a much clearer idea could be obtained from a cut.

The work is specially designed to meet the needs of the medical student, and it is not surprising, therefore, to find that the author does not take up the general treatment of the bacteria from the botanical or purely scientific point of view. Yet it would scarcely have seemed out of place to have given some hints regarding the usefulness of bacteria in the processes of nature and certainly one could reasonably hope to find some reference to their role in producing diseases of plants. But within the limitations set by the author, the work is most admirably written, and will prove a serviceable book for the laboratory and class room.

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[1] FRAENKEL, CARL.—Text-book of bacteriology; third edition. Trans. by J. H. Linsley. pp. 376. roy. 8vo. New York, Wm. Wood & Co.: 1891.

The pyrenomycetous fungi.

ONE OF THE most valuable systematic works upon fungi, yet published in this country, has just appeared. It is a thick octavo volume, with descriptions of the species (about 2,500) of North American Pyrenomycetes, including the Perisporiaceæ and Hysteriaceæ, illustrated with forty-one carefully drawn plates. Messrs. Ellis and Everhart,[1] who are also the publishers, have performed the task of gathering, studying and arranging the species of this large order in a manner that must meet the general approval of botanists. The work is more than a compilation, although even that would have been a decided service in the present scattered state of our literature, for the authors have revised the descriptions where needed, added uniform spore and ascus measurements, and looked after the synonymy. The Perisporiaceæ were elaborated for the volume by Prof. T. J. Burrill. The plates were drawn by the late F. W. Anderson, and are very satisfactory.

The methods adopted in the citation of authority for names is of particular interest at the present time. "The name of the author first publishing any species has been retained, placed in parenthesis in case the species has been removed from the genus in which it was first placed. The name after the parenthesis has been omitted as too cumbersome and unnecessary." The name, however, may be easily supplied by the reader, if desired, as it appears in the synonymy which immediately follows. The authors add, that "the piratical practice of omitting the first name and substituting the second in its place can not be too strongly condemned." Anent which we have only to quote Paul's beatitude, "Happy is he that judgeth not himself in that which he approveth."

Probably no one could have undertaken the task of arranging the American species of this order who was so well equipped for the work, both by familiarity with the plants and abundance of material, as the present authors, and it is extremely gratifying that they have produced such a satisfactory volume. It will give a decided impetus to the observation of these fungi, which will doubtless early lead to copious additions to the present work.

The volume would have been made more convenient for ready reference, if a synoptical table of genera, divisional headlines to the pages, and an index of hosts had been provided. There is, however, an excellent species index prepared by W. C. Stevenson, Jr. The volume is substantially and neatly bound.

[1] ELLIS J. B., and EVERHART, B. M.—The North American Pyrenomycetes: a contribution to mycologic botany. 8 vo. pp. 793. pl. 41. Vineland: Ellis and Everhart, 1892.—$8.00.

Two books on elementary botany.[1]

MISS NEWELL'S earlier volume treating of the vegetative parts of plants was favorably commented on in this journal at the time of its appearance several years ago. The present part treating of the flower and fruit is quite up to the mark of its predecessor; and as the subject it deals with is much more difficult to handle, that is to be taken as high commendation.

The book commences with a study of the bulbous plants that are commonly raised in the house, such as the tulip, hyacinth, crocus and snowdrop. From these the student is led to the earlier spring flowers, the forest and shade trees, the later spring and early summer flowers. In the treatment of each topic there is a combination of morphology and biology with taxonomy, which will strike most people as judicious, while the more radical will say that the taxonomy would better have been left for later study. The author is evidently escaping from the shackles of the older organography, as the mixture of the older and the more modern ideas and expressions indicates. To cite a single instance: On page 19 we are told that "Anthers are generally two-celled." On page 59: "Anthers are generally two-lobed, or as they are called, rather incorrectly, two-celled"; and in a foot-note the real structure of the anther is explained. Errors are unusually rare and this alone is a strong commendation when so many of the elementary books seem to be written by persons who do not know whereof they speak. The plants themselves and the difficulties young pupils are most likely to encounter are evidently intimately known to the author. We do not know a book which is better adapted for its purpose than this one, and can most heartily recommend it to those whom its title addresses: "teachers, and mothers studying with their children." The illustrations are from the pen of Miss H. P. Symmes, and although there is something of technique to the desired in their execution, they exhibit much artistic feeling and essential accuracy.

THE OTHER BOOK is of wholly different sort, not only in the way in which the subject is treated, but also in its quality. Miss Aitken has essayed to produce an "elementary text book of botany for the use of schools."[2] It is divided into three parts, the first being designated "Outlines of the external morphology and classification of flowering plants"; the second, "Description of some typical non-flowering plants

[1] NEWELL, JANE H.—Outlines of lessons in botany for the use of teachers, or mothers studying with their children. Part II: Flower and fruit. 12mo. pp. vi. 393. Ginn & Co., Boston: 1892.

[2] AITKEN, EDITH.—Elementary text-book of botany for the use of schools. 12mo. pp. xiii. 248. figs. 131. Longmans, Green & Co. London: 1891.

or cryptogams; the third, "General description of flowering plants." Under the first part is given a very brief organography, which is not at all accurate, followed by descriptions of single members of the more important orders, from which pupils are supposed to derive a "typical example" for the purpose of "grouping exceptional forms around the central type, to which in memory one should always return." We very much doubt the wisdom of such a plan, and its execution leaves much to be desired.

In the two succeeding parts the author is endeavoring to follow the pattern of Huxley and Martin's Biology. As it seems to us, however, she has neglected the most essential feature of their plan, viz.: the preparation of specific directions for the "practical work" of the student. The headings of this sort in this book do not cover any directions that will be of use to the student. The "practical work" follows a description of the plant. Under Funaria for instance, one reads, "Examine specimens of Funaria, and verify the facts mentioned above." Here are others: "Cut sections of the stem and observe the different kinds of cells." "In older specimens examine the sporogonia." It is quite certain also that many of the directions, particularly in physiological parts, have not been put to the test; else their impracticability would have been discovered. The figures, except those from other works, are poorly drawn for photo-engraving and consequently very blotchy. Altogether, so far as American schools are concerned, Miss Aitken has contributed nothing of educational value.

Minor Notices.

In a recent number of *Education* Professor Conway MacMillan has a vigorous criticism of the current methods of botanical instruction. Mr. MacMillan is radical and has at command an expressive vocabulary. The paper is worthy the attention of every teacher who can correct his own work thereby or who can influence others to do so. We should like to quote more than this sentence had we space: "The whole course in 'botany' is so planned that at its close the pupil may practice a few diagnoses, may apply a few binomial names and may gather a collection of pressed flowers which are pasted carefully in a synopsis book—such as certain misguided persons have been unable to refrain from publishing—and the whole unfortunate affair is dignified as a herbarium and is afterwards filed away upon some garret shelf, while its owner does not scruple, when questioned, to admit that he has 'had botany.' And he does not think very highly of it either."

In the Proceedings of the Biological Society of Washington for May 18, 1892, Mr. F. V. Coville describes, in advance of the full report of the collections of the Death's Valley expedition, several new species from that interesting region.

The report of the Royal Botanic Gardens at Trinidad for 1890 has been distributed. The report shows the work of the gardens in economic and scientific lines. Much attention is being given to the encouragement of the growing of fruits and fiber plants in the island. The illustrations are Messrs. Sprague's well-known "ink-photos" which almost equal the American "half-tone." The form of the report would be much improved by a change from folio to octavo. The Superintendent, Mr. J. H. Hart, working no doubt under many difficulties, is evidently active in promoting the interests of the garden.

OPEN LETTERS.

A botanical congress and nomenclature.

At a meeting of the Botanical Club of Washington, held April 23, 1892, a committee was appointed to consider and report upon the questions of botanical congress and nomenclature. At a special meeting called May 7, this committee presented the following report which was unanimously adopted by the club:

"Your committee, appointed to consider the questions of a botanical congress and botanical nomenclature, held a meeting on the second of May and prepared the following resolutions:

"*Resolved*, That, while favoring the final settlement of disputed questions by means of an international congress, we do not regard the present as an opportune time, but we recommend the reference of the question of plant nomenclature first to a representative body of American botanists.

"We suggest the consideration, by such body, of the following questions, among others: the law of priority; an initial date for genera; an initial date for species; the principle once a synonym always a synonym; what constitutes publication; the form of tribal and ordinal names; the method of citing authorities; capitalization.

"We recognize the Botanical Club of the A. A. A. S. as a representative body of American botanists and commend to that body for discussion and disposal the subject of nomenclature as set forth in these resolutions.

"Respectfully submitted,

Lester F. Ward, Geo. Vasey, F. H. Knowlton, B. T. Galloway, Erwin F. Smith, Geo. B. Sudworth, Frederick V. Coville. *Committee.*"

It was voted that a copy of these resolutions be communicated to the Botanical Gazette, *Torrey Botanical Club, Garden and Forest* and *Science*.—L. H. Dewey, Sec'y, *Washington, D. C.*

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1 Berichte der deutschen botanischen Gesellschaft x. 27.

NOTES AND NEWS.

M. CASIMIR ROUMEGUERE, editor of the *Revue Mycologique* died recently at his home in Toulouse.

THE DIRECTOR of the botanical gardens of Palermo, A. Todaro, died on the 18th of April last. His successor is Dr. Hermann Ross.

DR. EDUARD REGEL, director of the Imperial Botanical Garden at St. Petersburg died on the 27th of April, at the age of 77. He has been director of the St. Petersburg garden for nearly 40 years.

THE CLAIMS of *Ulota Ameriacna* to autonomy are discussed by Dr. G. Venturi in a recent number of the Revue Bryologique, where he also considers several forms of American Orthotricha collected by Röll and others in the northwest.

THE SUMMER CLASSES in botany at Martha's Vineyard, under the instruction of Mr. Edward S. Burgess, will be held this year as usual, meeting from July 11 to August 12. Courses in structural and systematic botany and in histological botany will be offered.

DR. A. ZAHLBRUCKNER has examined the changes proposed in certain genera of lichens by Kunze in his already notorious Revisio Generum Plantarum. Two of the names proposed are accepted; two are to be replaced by others of earlier date; and two, in spite of their priority, cannot be accepted, as they do not coincide with the modern genera.

MR. M. C. COOKE announces a handbook of Australian fungi of 500 octavo pages and thirty-six partly colored plates. It is published under the authority of the several governments of the Australian colonies, and only eighty copies are reserved for sale in Europe and America. The price is thirty shillings (about $7.50). It may be ordered from the author.

THE THIRD annual banquet in memory of Henry Shaw was given by the trustees of the Missouri Botanical Garden at the Mercantile club in St. Louis on May 19. About eighty-five guests, of whom fifteen were from other places, sat down to tables most beautifully decorated with orchids, cut üowers, potted plants and smilax. After an elaborate and elegant dinner, addresses were made by Dr. J. D. Butler, of Madison, Wis., Revs. Stimson and Snyder, of St. Louis, and D. C. Hart Merriam, of Washington. Chancellor Chaplin, of Washington University, presided.

A SERIES of 15 lectures and field meetings will be held at the Arnold Arboretum during May and June for the purpose of supplying popular instruction about the trees and shrubs which grow in New England. They began on Saturday, May 7th, and will close June 25th. They will be conducted by Mr. J. G. Jack. After a review of the plants to be especially observed during the meeting the class will adjourn to the plantations and the nurseries of the Arboretum for an informal study of the plants themselves. An hour and a half to two hours will be devoted to each meeting. An autumn course of fifteen meetings will be given from September 7th to October 26th. This course will give an opportunity for studying many of the trees and shrubs in fruit, their autumn foliage, and their buds and general appearance as they prepare for winter.

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